

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently Amended): A method for preparing carbon nanotubes or nitrogen-doped carbon nanotubes, ~~by comprising~~ pyrolysis, in a reaction chamber, of a liquid containing at least one liquid hydrocarbon precursor of carbon or at least one liquid compound precursor of carbon and nitrogen consisting of carbon atoms, nitrogen atoms and optionally hydrogen atoms and/or atoms of other chemical elements ~~such as oxygen~~, and optionally at least one metal compound precursor of a catalyst metal, ~~in which~~ wherein said liquid is formed under pressure into finely divided liquid particles, ~~such as droplets~~, by a specific injection system, ~~preferably a periodic injection system~~, and the finely divided particles, ~~such as droplets~~, formed in this way, are conveyed by a carrier gas stream and introduced into the reaction chamber, where the deposition and growth of the carbon nanotubes or nitrogen-doped carbon nanotubes take place.

Claim 2 (Currently Amended): The method ~~as claimed in~~ of claim 1, wherein ~~in~~ which said specific injection system is of the continuous or periodic automobile heat engine injector type.

Claim 3 (Currently Amended): The method ~~as claimed in~~ of claim 2, wherein ~~in~~ which the injection system is provided with a needle-type valve.

Claim 4 (Currently Amended): The method ~~as claimed in~~ of claim 1, wherein ~~in~~ which the nanotubes are regularly disposed or arranged in space, are generally aligned with respect to one another and are substantially perpendicular to the wall of the reaction chamber.

Claim 5 (Currently Amended): The method of claim 1, wherein ~~as claimed in any one of claims 1 to 4, in which~~ the nanotubes have a length of from a few micrometers, ~~for example 1 to 10 μ m, up to a few millimeters, for example 1 to 10 mm.~~

Claim 6 (Currently Amended): The method ~~as claimed in~~ of claim 1, wherein ~~in~~ which said liquid hydrocarbon is selected from nonaromatic liquid hydrocarbons.

Claim 7 (Currently Amended): The method ~~as claimed in~~ of claim 6, wherein in ~~which~~ said liquid hydrocarbon is selected from C5 to C20 alkanes ~~such as n-pentane, isopentane, hexane, heptane and octane~~; C5 to C20 liquid alkenes; C4 to C20 liquid alkynes; and C5 to C15 cycloalkanes ~~such as cyclohexane~~.

Claim 8 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 5, in ~~which~~ said liquid hydrocarbon is selected from optionally substituted C6 to C12 aromatic hydrocarbons ~~such as benzene, toluene and xylene~~.

Claim 9 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 5, in ~~which~~ said liquid compound consisting of carbon atoms, nitrogen atoms and optionally hydrogen atoms and/or atoms of other chemical elements ~~such as oxygen~~ is selected from liquid amines, ~~for example benzylamine~~; or nitriles ~~such as acetonitrile~~.

Claim 10 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 9, in ~~which~~ said liquid is in the form of a solution of the metal compound precursor(s) of a catalyst metal in the liquid hydrocarbons(s) or in the liquid compound(s) consisting of carbon atoms, nitrogen atoms and optionally hydrogen atoms and/or atoms of other chemical elements ~~such as oxygen~~.

Claim 11 (Currently Amended): The method ~~as claimed in~~ of claim 10, wherein in ~~which~~ said metal compound precursor of a catalyst metal is selected from the compounds consisting of carbon, hydrogen, optionally nitrogen and/or oxygen and at least one metal.

Claim 12 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 11, in ~~which~~ said metal compound precursor of a catalyst metal is selected from metal salts and organometallic compounds, ~~such as metallocenes~~.

Claim 13 (Currently Amended): The method ~~as claimed in~~ of claim 12, wherein in ~~which~~ said metal salts are selected from metal salts in which the counterion of the metal consists of a heteroatom ~~such as a halide~~.

Claim 14 (Currently Amended): The method ~~as claimed in~~ of claim 12, ~~wherein in~~ in which said metal salts are selected from metal nitrates, acetates, acetylacetones and phthalocyanines, ~~such as iron phthalocyanine and nickel phthalocyanine.~~

Claim 15 (Currently Amended): The method of claim 11, wherein as claimed in any one of claims 11 to 14, in which said metal is selected from iron, cobalt, nickel, ruthenium, palladium and platinum.

Claim 16 (Currently Amended): The method of claim 12, wherein as claimed in either one of claims 12 and 15, in which said organometallic compound is selected from ferrocene, nickelocene, cobaltocene and ruthenocene.

Claim 17 (Currently Amended): The method of claim 11, wherein as claimed in any one of claims 11 to 16, in which the solution also contains one or more compound(s) promoting the growth of the carbon nanotubes or nitrogen-doped carbon nanotubes, ~~such as thiophene or precursors, for example nitrates or alkoxides, of rare earths such as yttrium, lanthanum and cerium.~~

Claim 18 (Currently Amended): The method of claim 11, wherein as claimed in any one of claims 11 to 17, in which the concentration of the metal compound precursor of a catalyst metal in the solution is generally from 0.2 to 15% by mass.

Claim 19 (Currently Amended): The method of claim 11, wherein as claimed in any one of claims 11 to 18, in which the solution is a 2.5% by mass solution of ferrocene, preferably in toluene and/or cyclohexane.

Claim 20 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 9, in which said liquid is in the form of a colloidal suspension of metal nanoparticles in said at least one liquid hydrocarbon or in said at least one liquid compound consisting of carbon atoms, nitrogen atoms and optionally hydrogen atoms and/or atoms of other chemical elements ~~such as oxygen.~~

Claim 21 (Currently Amended): The method as claimed in of claim 20, wherein in ~~which~~ said metal nanoparticles are selected from nanoparticles of iron, nickel, cobalt, ruthenium, palladium, platinum and of their mixtures or their alloys.

Claim 22 (Currently Amended): The method of claim 20, wherein as claimed in ~~either one of claims 20 and 21, in which~~ one or more metal compound precursor(s) of a catalyst metal, as described in any one of claims 10 to 16, is (are) also dissolved in said colloidal suspension.

Claim 23 (Currently Amended): The method of claim 1, wherein as claimed in any ~~one of claims 1 to 22, in which~~ said finely divided liquid particles such as droplets have a dimension, ~~for example a diameter~~, of from a few tenths of micrometers to a few tens of micrometers, ~~preferably from 0.1 to 20 micrometers~~.

Claim 24 (Currently Amended): The method of claim 1, wherein as claimed in any ~~one of claims 1 to 23, in which~~ said specific injection system is periodic and operates in pulses.

Claim 25 (Currently Amended): The method as claimed in of claim 24, wherein in ~~which~~ the number of pulses is from 0.96 to 1200 per minute.

Claim 26 (Currently Amended): The method of claim 24, wherein as claimed in ~~either one of claims 24 and 25, in which~~ the volume of liquid injected in each pulse is from 2 to 100 microliters.

Claim 27 (Currently Amended): The method of claim 1, wherein as claimed in any ~~one of claims 1 to 26, in which~~ the finely divided liquid particles such as droplets formed by the injection system are evaporated in an evaporation device before they are introduced into the reaction chamber.

Claim 28 (Currently Amended): The method of claim 1, wherein as claimed in any ~~one of claims 1 to 27, in which~~ the pyrolysis is carried out at a temperature of from 600 to 1100°C, ~~preferably from 800 to 1000°C, more preferably from 800 to 900°C~~.

Claim 29 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 28, in which the pyrolysis is carried out for a time of from 5 to 60 min , ~~preferably from 15 to 30 minutes.~~

Claim 30 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 29, in which the pressure in the reaction chamber is a controlled pressure, for example less than atmospheric pressure.

Claim 31 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 30, in which the liquid contains a metal compound precursor of a catalyst metal, and the deposition and growth of the nanotubes take place directly on the walls of the reaction chamber.

Claim 32 (Currently Amended): The method of claim 1, wherein as claimed in any one of claims 1 to 30, in which the deposition and growth of the nanotubes take place on a substrate placed inside the reaction chamber.

Claim 33 (Currently Amended): The method as claimed in of claim 32, wherein in ~~which~~ the liquid does not contain a metal compound precursor of a catalyst metal, and the substrate is provided with a catalyst deposit.

Claim 34 (Currently Amended): The method as claimed in of claim 32, wherein in ~~which~~ the liquid contains one or more metal compound precursor(s) of a catalyst metal, and the substrate may or may not be provided with a catalyst deposit.

Claim 35 (Currently Amended): The method as claimed in of claim 32, wherein in ~~which~~ the substrate is selected from quartz substrates, silicon substrates and substrates made of metal oxides ~~such as Al₂O₃, Y₂O₃, MgO and ZrO₂.~~

Claim 36 (Currently Amended): The method as claimed in of claim 32, wherein in ~~which~~ the substrate is a fabric of carbon fibers or nitrogen-doped carbon fibers.

Claim 37 (Currently Amended): The method ~~as claimed in~~ of claim 33, wherein ~~or~~ 34, ~~in which~~ the catalyst deposit comprises one or more metals selected from transition metals ~~such as Fe, Ni and Co, and other metals such as Pd, Ru and Pt.~~

Claim 38 (Currently Amended): The method of claim 33, wherein ~~as claimed in any one of claims 33, 34 and 37, in which~~ the catalyst deposit is in the form of a thin film.

Claim 39 (Currently Amended): The method of claim 33, wherein ~~as claimed in any one of claims 33, 34 and 37, in which~~ the catalyst is deposited discontinuously.

Claim 40 (Currently Amended): The method ~~as claimed in~~ of claim 39, wherein ~~in~~ ~~which~~ the catalyst deposit is in the form of a set of discrete entities, ~~for example drops, beads, spots or dots of catalyst.~~

Claim 41 (Currently Amended): The method ~~as claimed in~~ of claim 40, wherein ~~in~~ ~~which~~ the deposit is ordered and said discrete entities are arranged in the form of a network or pattern, ~~for example a network of interconnected lines or rows.~~

Claim 42 (Currently Amended): The method ~~as claimed in~~ of claim 32, wherein ~~in~~ ~~which~~ the substrate consists of a layer of nanotubes or a plurality of stacked layers of nanotubes.

Claim 43 (Currently Amended): A device for carrying out ~~the method as claimed in any one of claims 1 to 42 a method for preparing carbon nanotubes or nitrogen-doped carbon nanotubes, comprising:~~

- a reaction chamber in which carbon nanotubes or nitrogen-doped carbon nanotubes are prepared by pyrolysis of a liquid containing at least one liquid hydrocarbon precursor of carbon or at least one liquid compound precursor of carbon and nitrogen consisting of carbon atoms, nitrogen atoms and optionally hydrogen atoms and/or atoms of other chemical elements ~~such as oxygen~~, and optionally at least one metal compound precursor of a catalyst metal;

- means for forming said liquid under pressure into finely divided liquid particles ~~such as droplets~~, for conveying said finely divided particles ~~such as droplets~~ by a carrier gas stream and introducing them into the reaction chamber;

- in which device said means for forming said liquid into finely divided liquid particles, for conveying them and introducing them into the reaction chamber comprise a specific injection system, preferably a periodic injection system, provided with an injection head, and a connection ring, in which the carrier gas intake is provided, connecting the injection system to the reaction chamber optionally via an evaporation device.

Claim 44 (Currently Amended): The device ~~as claimed in~~ of claim 43, ~~in which~~ wherein the side wall of the connection ring includes at least one carrier gas intake tube, said carrier gas intake tube opening into an annular groove surrounding the injection head of the system for injecting the liquid particles, and is placed behind it in order to surround the finely divided liquid particles without interfering with them.